

Panel Session: Integrating Software And Hardware for New Observing Strategies

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A large hexagonal graphic on the left side of the slide. It features a green circuit board pattern with a map of the Earth's continents overlaid in a darker green color.

ESTO
Earth Science Technology Office

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Why New Observing Strategies



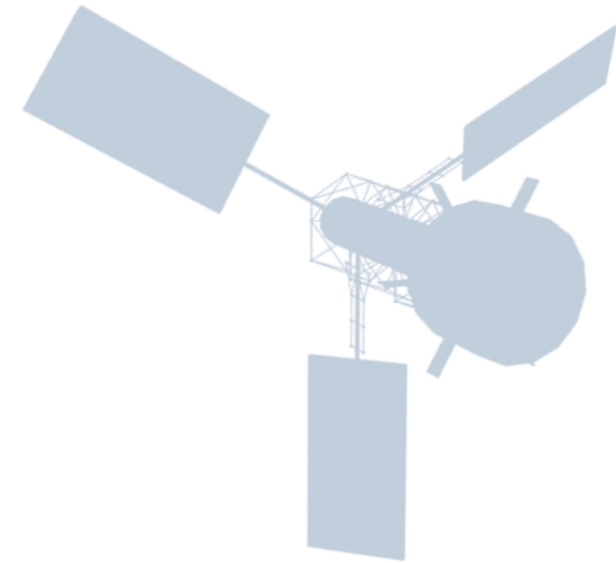
New Technology Environment:

- Novel Instrument Design
- Smaller Spacecraft and Components for reduced Size, Weight and Power (SWAP)
- Constellations vs. Monolithic Missions

New Programmatic Environment:

- Smaller Budgets
- Various Partners: OGAs, Industry, Academia, International
- New and Unique Science Measurements vs. Dedicated Missions
- Varied Launch and Deployment Opportunities

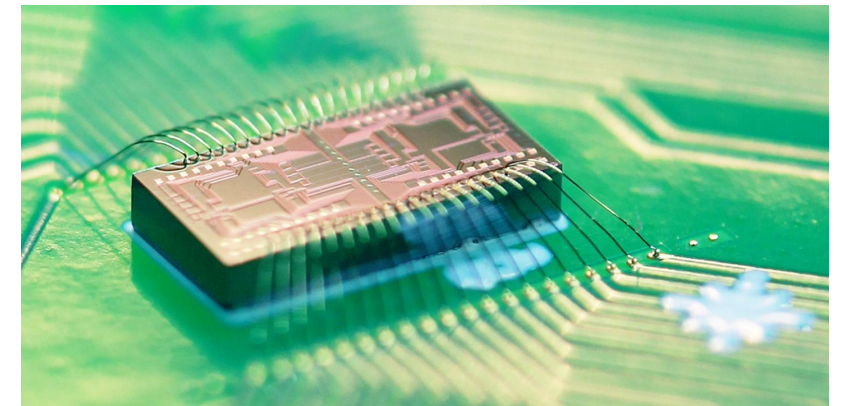
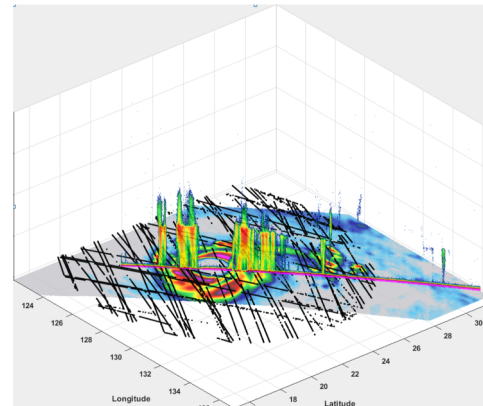
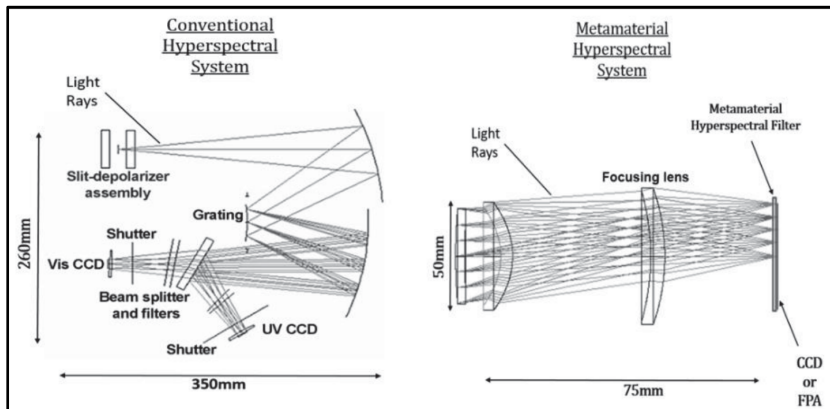
New Observing Strategies (NOS)



Latest Hardware Advances



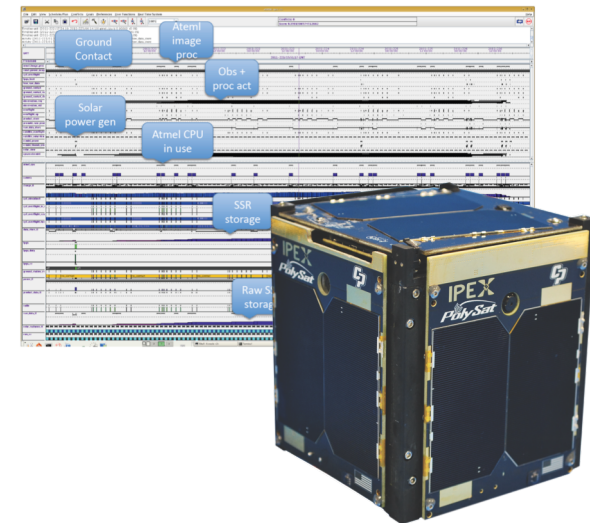
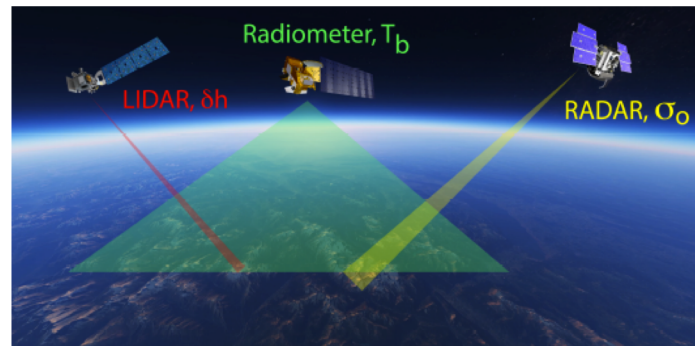
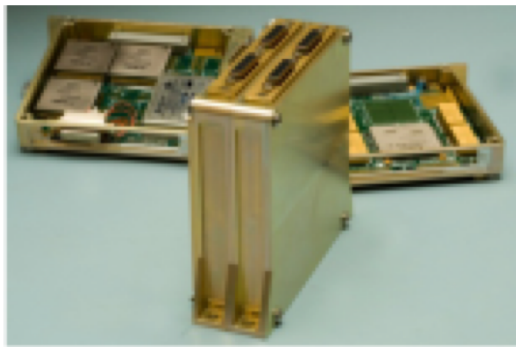
- Instrument Miniaturization (Freeform Optics, Photonic Integrated Circuits, etc.)
- Novel Components (Metamaterials, etc.)
- Smaller Spacecraft (CubeSats and Nanosats)
- High Performance Space Processors



Latest Software Advances



- Big Data Analysis and Machine Learning
- Artificial Intelligence
- Autonomous Decision Making
- Onboard Computing
- Intelligent & Collaborative Constellations/Sensor Webs



Paradigm Shift: Integrating Software and Hardware for NOS



- Measurement acquisition approached as a system of systems rather than on a mission basis to optimize:
 - Intelligence
 - Integration
 - Affordability
- How can we build smart sensors to reduce their SWAP requirements, or how can we build onboard autonomy that seamlessly optimize measurement acquisition by using data processing and sensor/spacecraft reconfiguration and retargeting, etc?
- Trade-offs between:
 - Smart Sensors vs. Centralized S/C Decisions
 - Computations Onboard vs. On the Ground
 - Full Autonomy vs. Semi-Autonomy
 - Constellations and Sensor Webs vs. Monolithic Missions

What's Next



- How can we design “Smart Sensors”?
- Which Software/Hardware Integration should/could be considered?
- How could Software/Hardware Integration improve measurements?
- What are the challenges?
- How to define requirements to represent a combination of Software and Hardware requirements?
- Other?